

TAXONOMY, DISTRIBUTION, AND MEDICINAL USES OF LEGUME TREES OF PAKISTAN

Mohammad Athar¹

*California Department of Food and Agriculture
2014 Capitol Avenue, Suite 109
Sacramento, California 95814, U.S.A.
atariq@cdfa.ca.gov*

Zahoor Ahmad¹

*National Institute of Agricultural Biotechnology
and Genetic Resources
Pakistan Agricultural Research Council
Islamabad, PAKISTAN*

ABSTRACT

A literature search was conducted to determine the medicinal legume trees found in Pakistan and used as remedies for various human disorders or diseases. The taxonomic position of these trees is discussed and their distribution is described to facilitate their collection. There are 40 medicinal legume tree species belonging to 25 genera of Fabaceae (Leguminosae). Most of these medicinal legume trees belong to Caesalpinoideae (10 genera and 16 species) followed by Mimosoideae (7 genera and 14 species) and Papilionoideae (8 genera and 10 species). This constitutes about half of the Pakistani legume trees possessing medicinal properties used for various ailments. The plant parts used for medicinal purposes included bark, roots, stem, leaves, flowers, fruits and seeds. These medicinal trees have good vegetative growth under cultivated conditions and are in ample supply for commercial exploitation. There is potential for growing medicinal plants in Pakistan as an income generating activity and for sustainable utilization of these medicinal legume trees. However, there is a need for systematic cultivation, commercial extraction using scientific methods and sustainable conservation of endemic medicinal legume trees for substantial utilization through community participation.

RESUMEN

Se realizó una búsqueda bibliográfica para identificar los árboles medicinales de las leguminosas que se encuentran en Pakistán y se usan como medicina para varias enfermedades humanas. Se discute la posición taxonómica de estos árboles y se describe su distribución para facilitar su recolección. Hay 40 especies medicinales de leguminosas arbóreas, pertenecientes a 25 géneros de Fabaceae (Leguminosae). La mayoría de estas leguminosas arbóreas medicinales pertenecen a las Caesalpinoideae (10 géneros y 16 especies) seguidas de Mimosoideae (7 géneros y 14 especies) y Papilionoideae (8 géneros y 10 especies). Esto constituye cerca de la mitad de las leguminosas arbóreas pakistaníes que tienen propiedades medicinales usadas para varios remedios. Las partes de la planta usadas con propósitos medicinales incluyen la corteza, raíces, tallos, hojas, flores, frutos y semillas. Estos árboles medicinales tienen buen crecimiento vegetativo en condiciones de cultivo y tienen amplio abastecimiento para la explotación comercial. En Pakistán hay potencial para el incremento de las plantas medicinales como actividad generadora de recursos económicos y para uso medicinal sostenible de estas leguminosas arbóreas. Pero, se necesita un cultivo sistemático, extracción comercial mediante métodos científicos y conservación sostenible de leguminosas arbóreas medicinales endémicas para una utilización importante mediante participación de la comunidad.

¹Disclaimer: The views expressed in this article are those of authors and do not necessarily represent those of their respective departments. The publication of this article does not constitute a recommendation or endorsement of the use of these legume trees as herbal medicine. The authors or their departments make no warranty, expressed or implied, and assume no legal liability for the use of these legume trees for medical purposes.

INTRODUCTION

Fabaceae (Leguminosae) is the third largest family of flowering plants comprising of 750 genera and 20,000 species with worldwide distribution (Sprent 2001). In Pakistan legumes form a considerable portion of the flora and are the third largest family in order of abundance (Kirkbride 1986). Ali (1973a, b, 1977) reported 107 genera and 539 species of legumes from Pakistan of which 68 genera have one or more native species (Kirkbride 1986). There are about 82 legume trees in Pakistan of which 27 tree species belong to Caesalpinoideae, 36 to Mimosoideae and 19 to Papilionoideae (Ali 1973a, b, 1977). These trees have considerable significance as source of timber, lumber and fire wood. They are also used as ornamental and shade trees in gardens, orchards and roadside plantations (Malik & Farooq 1984).

Classification of medicinal plants is organized in different ways depending on the criteria used. In general, medicinal plants are arranged according to their active principles in their storage organs, particularly roots, leaves, flowers, seeds and other plant parts (Athar & Nasir 2004; Athar & Siddiqi 2004; Foster & Duke 1990; Moerman 1986, 1991, 1996; Shaheen et al. 2003). These principles are valuable to human for treatment of different diseases (Borchers et al. 2000; Duke 1997; Shaheen et al. 2003; Shinwari & Khan 1998). Reports on the classification of many Pakistani medicinal plants that could be used for remedies and medicinal preparations are sporadic or lacking (Athar & Nasir 2004; Athar & Siddiqi 2004; Durrani et al. 2003; Saeed et al. 2004). Athar and Siddiqi (2004) described the taxonomy, distribution and flowering period of 95 species used as medicinal flowers in Pakistan. In another study, Athar & Nasir (2004) described the taxonomy of 78 plant species yielding vegetable oil used in cosmetics and skin and body care products. This third publication in the series presents the taxonomy of medicinal legume trees of Pakistan and their regional distribution, and summarizes the utilized tree parts and their principal method of application for various ailments.

MATERIALS AND METHODS

A literature search was conducted to determine the legume trees of Pakistan that are used as remedies for various disorders or diseases (Allen & Allen 1981; Athar & Siddiqi 2004; Bach 1994; Baquar 1989; Borchers et al. 2000; Duke 1997; Gunasena & Hughes 2000; Malik & Farooq 1984; Nasir & Rafiq 1995; Palaniswamy 2003; Rasool 1998; Rizvi 1998; Said 1969; Shaheen et al. 2003; Shinwari & Khan 1998; William & Ahmad 1999; Zaman & Khan 1970), and their taxonomic position was determined. The genera were arranged alphabetically within sub-families. The scientific and local names are provided that are commonly associated with these legume trees. Their distribution in various parts of Pakistan is also described to facilitate their collection. The nomenclature

ture and classification followed Polhill and Raven (1994), and author citations followed Brummitt and Powell (1992).

RESULTS AND DISCUSSION

The taxonomic position of 40 species of medicinal legume trees is given in Table 1. These legume trees are distributed in 25 genera and all three sub-families of Fabaceae (Leguminosae). This constitutes about half of the Pakistani legume trees possessing medicinal properties used for various ailments. The list is comprehensive, yet not complete as more tree species could be investigated and added to the list. Most of these medicinal legume trees belong to Caesalpinioideae (10 genera and 16 species) followed by Mimosoideae (7 genera and 14 species) and Papilionoideae (8 genera and 10 species). The plant parts used for medicinal purposes included bark, roots, stem, leaves, flowers, fruits and seeds. Table 1 summarizes the ailments, tree parts and principal methods of application. Specific prescriptions, such as dosage and frequency, are not given, as these are rarely specified in literature and can vary considerably among users according to the recipe. Moreover, the table does not rank the order of the species importance as a medicinal source for the ailments, though this can be found in Hamdard Pharmacopocia of Eastern Medicine (Said 1969).

Legume trees are amazing natural resources. These trees provide wood for home building, packaging that keeps food fresh during shipment, and natural products like cellulose that are found in everything from the instant soup that we eat to the fabrics that we wear. Legume trees give us food, fodder, fabric, furniture, fatty acids, oils, tannins, gums, medicines, even cosmetics (Allen & Allen 1981), and the list goes on and on expanding to their nitrogen-fixing properties (Allen & Allen 1981; Sprent 2001; Subba Rao & Rodriguez-Barrueco 1993). We get food, clothing and shelter from legume trees all in one environmentally friendly package. Essential oils have been extracted from legume trees for many years for their healing and nurturing properties (Athar & Nasir 2004). Today we use these same essential oils in aromatherapy to promote health, well-being and balance in body, mind and spirit. These plants are ever lasting, easily available and centuries old, tested sources for healing various ailments (Athar & Siddiqi 2004; Athar & Nasir 2004).

An estimated 80% of the rural population in Pakistan depends on traditional medicines for their primary healthcare needs using legumes and other plants or their active principles (William & Ahmad 1999). By trial and error, these people have learnt to employ certain plants, plant parts and extracts to cure diseases and ailments. In this context, certain legume trees also merit consideration for their therapeutic properties, which are being commercialized. It is worth mentioning that nomadic people and rural populations are much more familiar with the use of medicinal plants as compared to people living in the

TABLE 1. Taxonomy, distribution and medicinal uses of legume trees in Pakistan.

Species	Local Name	English Name	Distribution	Medicinal Use
Fabaceae (Leguminosae) Caesalpinioideae				
<i>Bauhinia purpurea</i> L.	Kaliar	Purple Bauhinia	Grown in Punjab, NWFP, Rawalpindi	Flowers are used as purgative. Flowers and buds used for indigestion. Stem bark decoction used for body pain and fever. Paste from bark is given for cancerous growths in stomach.
<i>Bauhinia semla</i> Wunderlin	Kandla	Bauhinia	Jowlian Reserve, Rawalpindi, Hazara	Bark is astringent; used in diarrhea and dysentery. Decoction of leaf is used for headache and malaria.
<i>Bauhinia variegata</i> L.	Kachnar	Mountain ebony	Grown in gardens of Punjab and Sindh	Flowers are aperient.
<i>Caesalpinia bonduc</i> (L.) Roxb.	Fevernut	Gray nicker bean	Grown in gardens of Pakistan	Leaf decoction taken for asthma and mental distress; pulverized seed infusion taken for fever and intestinal worms.
<i>Caesalpinia pulcherrima</i> (L.) Sw.	Gul-e-mohur	Paradise flower	Grown in gardens of Pakistan	Root decoction used for fevers; flowers used for asthma and bronchitis and as anti-pyretic and expectorant.
<i>Cassia fistula</i> L.	Amaltas	Golden shower, Indian laburnum	Naturalized throughout Pakistan	Flowers used for cough, diphtheria, constipation and edema.
<i>Ceratonia siliqua</i> L.	Kharnub	Carob	Introduced and naturalized in Punjab, Islamabad and NWFP	The pods are astringent and are used for coughs. Seed husk is astringent and purgative.
<i>Chamaecrista absus</i> (L.) H.S. Irwin & Barneby	Chasku	Cassia	Wild in open places in NWFP and Punjab	Seeds used for skin diseases.
<i>Delonix regia</i> (Bojer ex Hook.) Raf.	Gulmohar	Peacock flower	Planted in Karachi, Hyderabad and Lahore	Leaf decoction taken for constipation. Flowers are anthelmintic.

TABLE 1. continued

Species	Local Name	English Name	Distribution	Medicinal Use
<i>Parkinsonia aculeata</i> L.	Valaiti kikar	Jerusalem-thorn	Planted in Sindh, Karachi, Hyderabad, Punjab and Lahore	Leaf, fruit and stem decoctions taken for fever and also are abortive. Flowers and leaf poultice used for rheumatism.
<i>Saraca indica</i> L.	Ashok	Ashok tree	Cultivated in gardens in Punjab and Sindh	Bark is astringent; used in menorrhoea and uterine infections; also used for scorpion-sting.
<i>Senna olata</i> (L.) Roxb.	Dadmurdan	Ringworm cassia	Sometimes cultivated in Pakistan	Flowers are laxative and also useful for softening skin.
<i>Senna alexandrina</i> Mill.	Sennahindi	Indian senna	Wild in Punjab and Sindh	Stem, pods and leaves are useful in habitual costiveness. These lower bowels, increases peristaltic movements of the colon by its local action upon the intestinal wall. Plant is used as expectorant, wound dresser, antidyseric, carminative and laxative.
<i>Senna italica</i> Mill.	Kasordhi	Senna	Found in Punjab and Sindh	Plant useful for malaria and constipation. Pods used as laxative and seed for stomachache.
<i>Senna siamea</i> (Lam.) H.S. Irwin & Barneby	Kasood tree	Siamese shower	Cultivated in Karachi, Sindh	Flowers used as anthelmintic, anti-hypertensive, laxative, tranquilizer and sedative and for asthma, dandruff and insomnia.
<i>Tamarindus indica</i> L.	Imli	Tamarind	Grown in Sindh, Punjab, Jehlum, Karachi	Leaf decoction taken for throat infection, intestinal worms and liver ailments. Flowers used as anti-viral against new castle disease virus and are astringent and sedative. Fruits used for loss of appetite, constipation and rheumatism.

TABLE 1. continued

Species	Local Name	English Name	Distribution	Medicinal Use
Fabaceae (Leguminosae) Mimosoideae				
<i>Acacia catechu</i> (L.f.) Willd.	Khair, Katha	Black cutch	Distributed in the foothill zone of NWFP and Punjab	Bark is astringent. Root is made into paste and applied on joints for rheumatism.
<i>Acacia farnesiana</i> (L.) Willd.	Kabuli kikar	Sweet acacia	Grows in Sindh, Karachi, Punjab	Leaves used for fever, typhus, tuberculosis, gangrene, bladder infection and wounds; flower tea used for stomachache; crushed fruit juice used for diarrhea and eye and throat infections.
<i>Acacia nilotica</i> (L.) Delile	Kikar	Gum-arabic	Found in Sindh, Punjab, Baluchistan, NWFP	Flowers used for jaundice and palpitation. Leaf juice is taken with fennel for bloody dysentery. Powdered bark given for acute diarrhea. Extracts from root and bark are used as taenifuge, and gum is used as emollient.
<i>Acacia senegal</i> (L.) Willd.	Khor	Gum-arabic acacia	Karachi, Sindh, Balochistan	Gum demulcent and emollient used internally for intestinal mucosa and externally applied on inflammations
<i>Adenanthera pavonina</i> L.	Barighumchi	Bead tree	Grown in Sindh, Karachi	Wood extract used for migraine and headache; bark and leaf decoction for diarrhea, dysentery and tonsillitis.
<i>Albizia chinensis</i> (Osbeck) Merr.	Ohi		Sub-Himalayan tract, Punjab	Infusion of the bark used as lotion for cuts, scabies and skin diseases.
<i>Albizia julibrissin</i> Durazz.	Ghulabi siris	Silk tree	Outer Himalayan zone	Flowers used for mild constipation, boils, carbuncles and swelling.

TABLE 1. continued

Species	Local Name	English Name	Distribution	Medicinal Use
<i>Albizia lebbek</i> (L.) Benth.	Siris	Lebbek tree	Found in Sindh, Punjab, Bajaur, Malakand	Similar to <i>Albizia julibrissin</i> .
<i>Albizia procera</i> (Roxb.) Benth.	Sufaid-Siris	Lebbek tree	Cultivated and naturalized, Sindh, Karachi, Hasanabdal, Mirpur	Leaves used as poultice on ulcer. Plant has insecticidal properties.
<i>Leucaena leucocephala</i> (Lam.) de Wit	Ipil-Ipil	Ipil-Ipil	Introduced in Sindh, Punjab, NWFP	Root decoction taken for fever; leaf tea taken for typhoid and digestive tract ailment; root and twig decoction used for severe back pain; root and bark are abortive.
<i>Pithecellobium dulce</i> (Roxb.) Benth.	Jungle Jaleebi	Blackbead	Found in Sindh and Karachi	Root bark decoction taken for dysentery; leaf used for indigestion; leaf poultice used for convulsions, venereal lesions and pain; fruit pulp used for hemoptysis; seed used for nasal congestion and internal ulcer.
<i>Prosopis cineraria</i> (L.) Druce	Jhand	Mesquite	Found in Sindh, Baluchistan and Punjab	Flowers are beneficial against miscarriage.
<i>Prosopis juliflora</i> (Sw.) DC.	Jhand	Mesquite	Found in Sindh, Baluchistan and Punjab	Eye drops made from leaf juice or cooked leaves and applied or taken orally for eye infections. Gum exudates from trunk used for colds and flu. Fresh root taken orally for diarrhea. Bark and fruit decoction taken for bronchial infection and sinus congestion.

TABLE 1. continued

Species	Local Name	English Name	Distribution	Medicinal Use
<i>Samanea saman</i> (Jacq.) Merr.	Siris	Lebbek tree	Grown in Sindh, Karachi	Fruit decoction used for anxiety, nervousness; fruit ingested for dysentery and hemorrhage; leaf tea or infusion used for constipation; seed chewed for throat infection.
Fabaceae (Leguminosae) Papilionoideae				
<i>Butea monosperma</i> (Lam.) Taub.	Dhak	Flame of the forest, Bengal Kino	Cultivated in Punjab and NWFP, sporadic in Rawalpindi district	Anti-pyretic, appetizer, aphrodisiac, blood purifier, diuretic, tonic, viral hepatitis. Seed is anthelmintic. Gum is astringent, used in diarrhea and dysentery. Leaves are tonic, astringent; flowers are astringent, diuretic, depurative and aphrodisiac. Bark and seeds are used for snakebites.
<i>Dalbergia sissoo</i> Roxb. ex DC.	Shisham	Sissoo	Widely distributed in Punjab, Sindh and NWFP	Leaves are bitter and stimulant; decoction is used in gonorrhea; root is astringent. Wood is also used in leprosy, boils, eruptions and to stop vomiting.
<i>Erythrina stricta</i> Roxb. var. <i>suberosa</i> (Roxb.) Niyomdham	Dhauldak	Coral tree	Sadiqpur Hills, Murree Road, Mirpur	The bark is laxative, diuretic, emmenagogue, expectorant, anthelmintic, antibilious and febrifuge, and the decoction is given for dysentery and as a vermifuge and is effective as an eye lotion in ophthalmia. Leaves are anthelmintic, cathartic, glalactagogue and discutient. Leaf juice used externally as a dressing for ulcers and for killing maggots in sores.
<i>Erythrina variegata</i> L.	Pangar	Variegated coral tree	Cultivated as road side tree	Leaves contain a mixture of alkaloid, hyaphorine is present in leaves, seeds and bark. Apart from hyaphorine, betaine and choline are also found.

TABLE 1. continued

Species	Local Name	English Name	Distribution	Medicinal Use
<i>Gliricidia sepium</i> (Jacq.) Kunth ex Walp.	Sapium/Lal Tali	Madre tree	Only at experimental stations at Karachi and Islamabad	Leaf bath used for fever pain; leaf tea used for sinus inflammation and gonorrhea; root tea used for kidney ailments, edema and hepatitis; leaf poultice used for skin diseases and wounds. Flowers are used for diabetes.
<i>Milletia pinnata</i> (L.) Panigrahi	Karanja	Pongam	Cultivated in Sindh, Punjab	
<i>Ougeinia oojeinensis</i> (Roxb.) Hochr.	Sandan	Sandan	Cultivated in Punjab Gardens; Mirpur east (Sub-Himalayan tract)	The bark is febrifuge. The exudation obtained after incision is used in dysentery and diarrhea. The decoction is given to patients having highly colored urine; also used as fish poison.
<i>Peltophorum pterocarpum</i> (DC) Backer ex K. Heyne	Peela Gulmohar	Copperpod tree	Cultivated in Punjab as road side plantation	In traditional medicine, the bark used in various preparations as a tonic or as a astringent to cure or relieve intestinal disorders like consti- pation and ringworms, after pain at childbirth, sprains, bruises and swellings, or as a lotion of eye troubles, muscular pains and sores. Leaves in form of decoction used to wash unhealthy skin.
<i>Sesbania grandiflora</i> (L.) Pers.	Bansa	Sesbania	Planted in Karachi, Kutch, Sindh, Punjab	Root paste used for rheumatism; root resin used for phlegm; bark decoction used for fever and diabetes; flower juice improves vision (as eye drops).
<i>Sesbania sesban</i> (L.) Merr.	Janter	Sesbania	Cultivated in Sindh, Punjab	Leaf compress applied to infected areas for suppuration. Anti-fertility activity of flowers also reported.

cities (Durrani et al. 2003; Saeed et al. 2004; William & Ahmad 1999). It is interesting to note that elderly people, particularly women, were more aware of the value of the medicinal flora than younger generations. Nomadic people and rural populations depend upon legume trees not only as medicinal plants but also for fuel wood and fodder and forage for their livestock. Some of the medicinally important plants are over-harvested due to their extensive use, which may lead to their extinction. Overgrazing and cutting of legume trees for fuel wood and commercial exploitation has also resulted in reduced vegetation cover, promoted soil erosion and deterioration of Pakistani rangelands. However, legume trees cultivated in the gardens, parks, and roadside and riparian plantations in Sindh and Punjab have good vegetative growth and are in ample supply for commercial exploitation.

Pakistan has the potential for sustainable utilization of its medicinal legume trees, and mainly exports crude plant materials that have a low value in the international market (Shaheen et al. 2003). On the other hand countries like China and India export value-added plant extracts standardized on the basis of their active ingredients. There is enormous price difference between crude plant material and properly processed plant extracts. Moreover, developed countries do not allow the import of unprocessed raw plant material due to rigorous phytosanitary regulations (Crockett & Khan 2003; FAH 2003). It is therefore important that Pakistani producers and traders of medicinal plants should consider adding value to their exports by carrying out the initial processing and quality evaluation in Pakistan. However, attention needs to be paid to the systematic cultivation, scientific extraction and sustainable conservation of endemic medicinal legume trees for substantial utilization through community participation.

A team from the Pakistan Forestry Institute, Peshawar has carried out an ethnobotanical study in northern areas of Pakistan (Rasool 1998). This study identified economically valuable trees that can be collected from the wild and medicinal plants that can be grown commercially on common or agricultural land. Several species are no longer found in the area, including *Taxus baccata*, the source of the anti-cancer agent Taxol. There is potential for cultivating medicinal plants as an income-generating activity (Athar & Nasir 2004; Athar & Siddiqi 2004). Further research should be carried out on the floristic composition of medicinal plants and the present status of medicinal cum economic plants, including their market potential within the country and in the international market. The study should also look at the prospects for conserving endemic medicinal and economic species for sustainable use through community participation.

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